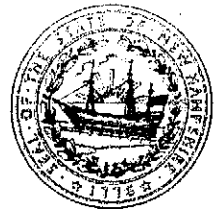




The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner



March 25, 2009

John Gay, E.I.
North Country, Environmental Services, Inc.
3 Pitkin Court
Montpelier, Vermont 05602

Subject: North Country Environmental Services (NCES) application to modify Permit # DES-SW-SP-03-002 for Stage IV Phase II of the NCES Landfill, Trudeau Road, Bethlehem, New Hampshire / Document Log # 200900018

Dear Mr. Gay:

In accordance with the provisions of Env-Sw 304.03, the New Hampshire Department of Environmental Services (DES) has reviewed the above-referenced application and determined it is administratively complete.

In addition, DES completed a limited technical review of the application, resulting in the following determinations:

1. The application provides no information to determine the source of the continuing groundwater contamination at the site, and does not provide additional information responsive to the reasons for denial stated in Section II-B of DES's denial letter dated December 12, 2008. Therefore, DES has determined that the reasons for denial of NCES's previous application, as stated in Section II-B of DES's December 12, 2008 denial letter, still exist. See enclosed letter, which is incorporated herewith as part of this record of decision. In accordance with the provisions of Env-Sw 305.03, the current application is hereby denied for those same stated reasons.
2. The revised berm and liner design is conceptually approvable, to the extent that it eliminates those design features that provided a basis for having denied NCES's previous application, as stated in Section II-A of the December 12, 2008 letter referenced above. Because DES performed a limited technical review of the application, and because the application was denied for the reasons stated in Paragraph 1 of this letter, DES reserves the right to perform a detailed technical review of the design, in accordance with Env-Sw 304.07, as part of any new permit application review, should NCES be able to demonstrate to DES's satisfaction that the issues for denial have been addressed.

DES Web Site: www.des.nh.gov

P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095

Telephone: (603) 271-3644 Fax: (603) 271-2181 TDD Access: Relay NH 1-800-735-2964



In accordance with RSA 149-M:8 and Env-Sw 305.03(a)(3), this decision issued by DES may be appealed to the Waste Management Council as provided under RSA 21-O:9 and Env-WMC 200.

If you have questions regarding this decision, please contact me at the letterhead address, by telephone at (603) 271-1997, or via e-mail at michael.wimsatt@des.nh.gov.

Sincerely yours,

Michael J. Wimsatt, P.G., Director
Waste Management Division

Enc: DES denial letter dated December 12, 2008

CC: Bryan Gould, Esq, Brown, Olson & Gould
Town of Bethlehem
Brenda Keith, Esq., Boutin & Altieri
Robert Grillo, P.E., CMA Engineers
Paul Rydel, P.G., SHA Associates
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Richard Head, Esq. NHDOJ



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner



December 12, 2008

SENT VIA E-MAIL AS A .PDF AND VIA FIRST CLASS MAIL

John Gay, E.I.
North Country Environmental Services, Inc.
3 Pitkin Court
Montpelier, Vermont 05602

Subject: North Country Environmental Services (NCES) Applications to Modify Permit # DES-SW-SP-03-002 for Stage IV Phase II of the NCES Landfill, Trudeau Road, Bethlehem, New Hampshire

Dear Mr. Gay:

In accordance with the provisions of Env-Sw 304:07 of the NH Administrative Rules for Solid Waste Management (Rules), the New Hampshire Department of Environmental Services (DES) has completed its review of the above referenced applications to modify permit #DES-SW-SP-03-002. The review included information submitted in the permit application documents cited as items 1. - 10. below, as well as information provided by abutters, town officials, and persons participating in the public hearing process that commenced on September 16, 2008 and closed on October 16, 2008. Both applications are hereby denied for reasons explained in this letter. In addition, DES's response to public comment and hearing testimony is attached to this letter as Appendix A.

I. Background

On November 30, 2007 NCES submitted the following applications for permit modification:

1. Type 1B permit modification application seeking approval to redesign portions of the Stage IV Phase II solid waste landfill located on Trudeau Road in Bethlehem¹; and
2. Type II permit modification application seeking approval to construct the modified facility.²

¹ WMD document log #200700211.

² WMD document log #200700211.

DES Web Site: www.des.nh.gov

P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095

Telephone: (603) 271-3644 Fax: (603) 271-2181 TDD Access: Relay NH 1-800-735-2964

Those modifications propose to develop 1,300,000 cubic yards of permitted Stage IV capacity within the boundaries of a 51 acre area comprised of a 10 acre lot and a 41 acre lot. A permit for Stage IV of the landfill was previously granted by DES in 2003. Under the provisions of that permit, construction of Stage IV was to have occurred, in part, on land outside of the 51 acre area. The combined effect of the Town of Bethlehem's 1992 ordinances prohibiting construction or expansion of a private landfill, a 2001 New Hampshire Supreme Court decision that those ordinances do not apply to the 51 acre area, and a 2004 New Hampshire Supreme Court ruling on the extent to which local approvals are necessary for landfill expansion effectively limited expansion activities to within the 51 acre area.

The pending applications propose to modify the plan that was approved by DES in 2003 by shifting the Stage IV development to the 51 acre area. Under the revised plan, NCES would construct the Stage IV expansion on top of the existing landfill. The additional waste would be contained utilizing near-vertical mechanically stabilized earth (MSE) berms.

Subsequent to submitting the applications described in paragraphs 1-2 above, NCES submitted the following additional permit application information:

3. On February 25, 2008, additional information in response to a DES letter dated February 8, 2008 requesting certain information to complete the application.³

4. On March 11, 2008, additional information in response to a DES letter dated March 3, 2008 requesting certain information to complete the application.⁴

5. On April 7, 2008, additional information in response to a DES letter dated March 12, 2008 requesting certain information to complete the application.⁵

6. On May 16, 2008, the "NCES Stage IV/Phase II Fill Area Characterization."⁶

By letter dated May 30, 2008, DES notified NCES that the application was complete and that DES was commencing a technical review of the proposal. The documents constituting the complete application were those enumerated above as items 1.- 6.

³ WMD document log #200800038.

⁴ WMD document log #200800041.

⁵ WMD document log #200800061.

⁶ WMD document log #200800083.

On July 15, 2008, DES held a public information meeting in Bethlehem, providing an opportunity for interested persons to obtain information from both the applicant and DES concerning the applications, the application process, and the facility.

By letter dated September 10, 2008, DES notified NCES that it had completed its technical review and determined there were certain issues of concern that warranted additional attention, including design drawing and specification inconsistencies, MSE berm design concerns, and groundwater contamination conditions indicating NCES's mismanagement of the leachate collection system and/or a release through the existing landfill liner system.

On September 16, 2008, DES held a public hearing in Bethlehem to receive public testimony on the application, and left the public hearing record open through October 16, 2008 for receipt of written testimony.

In response to DES's September 10, 2008 letter, NCES submitted the following additional information to supplement the application information previously submitted:

7. A letter report dated September 29, 2008⁷, providing information in response to items of concern listed as A, B and C in DES's September 10, 2008 letter.
8. A letter dated October 13, 2008 addressing groundwater contamination concerns listed under item D of DES's September 10, 2008 letter, including as attachments a Liner Leakage Analysis dated October 14, 2008, prepared by CMA Engineers, Inc. and a Hydrogeologic Analysis dated October 17, 2008, prepared by Sanborn, Head & Associates, Inc.⁸
9. Additional information to address item D of the September 10, 2008 letter, identified as "Analysis of Site Hydrogeologic Conditions Relative to Potential Leachate Leakage – Monitoring Well MW-402U/L Area" dated October 24, 2008, prepared by Sanborn, Head & Associates, Inc.⁹
10. A letter dated November 7, 2008 with attached plans, providing a revised MSE berm and liner design between stations 0+00 to 12+25 and between 28+00 and 36+14.¹⁰

⁷ WMD document log #200800153.

⁸ DES electronic document ID #4143113.

⁹ DES electronic document ID #4144804.

¹⁰ WMD document log #200800178.

II. Reasons for Denial

DES denies the requested permit modifications on the basis of two issues. First, for the reasons stated below, DES concludes that the MSE berm and liner design does not comply with the requirements of Env-Sw 1103.01(a), Env-Sw 1103.01(b) and Env-Sw 1004.01. Second, for the reasons stated below, DES can not conclude at this time that the proposed facility can comply with Env-Sw 1002.02(d). Both of these issues are discussed in detail below.

A. MSE Berm/Liner Design

The 2039 lineal feet of mechanically stabilized earthen ("MSE") berm between stations 0+00 and 12+25 and between stations 28+00 and 36+14, as depicted on sheets C-29 to C-31 of the design plans, form part of the containment system for the landfilled waste and must conform to all applicable requirements of the Rules. Based on a thorough review of the original MSE berm design submitted with the application on November 30, 2007,¹¹ DES notified NCES by letter dated September 10, 2008 that the berm design was deficient. In response, the applicant submitted a revised MSE berm design on November 7, 2008¹² to replace the original design. For reasons stated below, DES has determined that the revised design of the MSE berm and its associated liner do not meet the requirements of Env-Sw 1103.01(a), Env-Sw 1004.01 and Env-Sw 1103.01(b) of the Rules.

The design of the above noted portions of the MSE berm shows a double liner system consisting of two HDPE geomembrane liners, separated by drainage geocomposite, placed on the near-vertical (1 foot of run to 5 feet of rise or 1:5) inside face of the MSE berm. The design also includes a "shingled" or hanging installation of geosynthetic clay liner over every three lifts of the MSE berm. The use of the two HDPE geomembrane liners on such a steep slope departs significantly from the conventional and generally accepted design standards for solid waste landfill liner systems. Conventional landfill liner system design specifications involve liner installation on slopes of approximately 3:1 (3 feet of run to 1 foot of rise, or 3:1) or less.

Double liner systems deployed on slopes of 3:1 or less have a known track record of constructability, durability, and performance that demonstrates their ability to protect human health and the environment.

Constructability describes the technical and engineering barriers to construction of the landfill. A typical landfill design with 3:1 slopes has well understood

¹¹ WMD document log #200700211.

¹² WMD document log #200800178.

constructability issues, and the technical and engineering issues have largely been addressed. NCES's near-vertical slope for its double liner system presents new and significantly more difficult constructability issues.

Durability describes the likelihood of failure with time. Double liner systems deployed on a 3:1 slope are well understood, and have existed under New Hampshire landfills for years. As the slope increases to the near-vertical slope as designed by NCES, the durability of the system diminishes. For example, vertical slopes place a greater stress on liner sections where they are welded together, at the base where the vertical wall angles sharply to the base of the landfill, and on the anchor point where the liner system anchors into the top of the wall. Any defects in construction are also reflected in durability.

Performance of landfills with double liner systems on a 3:1 slope is similarly well documented and understood in New Hampshire and throughout the country. Double liner systems are designed to collect leachate flowing through the landfill, and to prevent contamination of soil and groundwater under and adjacent to the landfill. As the risks associated with constructability and durability of the near-vertical liner slope increase, so does the risk of performance failure increase.

DES has been unable to find an example of a similar landfill liner application, in which HDPE geomembrane liner material has been successfully deployed and anchored along such extreme slopes over a distance comparable to the revised MSE berm design. Given the lack of similar projects to review, DES is unwilling to rely solely upon the applicant's analyses for expected performance. The proposed design poses a greater risk of failure, compared to conventional designs. NCES proposes to install, seam, test and anchor the geomembrane liners on a near-vertical MSE berm. Each of these elements of NCES's liner design pose additional failure risks, which increases the overall risk of failure of the liner system. Issues of concern to DES include: the constructability of the liner on the near-vertical berm wall; the efficacy of the anchor trench design for such a high, steep installation; and the tensile and shear stresses that will exist. DES finds that the cumulative increases in risk are unacceptable and unwarranted, and pose unnecessary risks to human health and the environment.

Moreover, DES has determined that approval of such a design would set a precedent that would significantly decrease the minimum standards for landfill design in the State, potentially resulting in higher risk designs and construction at other landfill facilities in New Hampshire. Acceptance of such increased risks would be inconsistent with DES's role to protect human health and the environment, and are inconsistent with the existing criteria for approval of landfill design.

DES views the above outlined concerns as technical deficiencies in the proposed design. As a result of these deficiencies, DES has identified several provisions of the

applicable Rules that are either not met, or for which there is substantially insufficient or ambiguous information that precludes a determination that the proposed facility modifications will comply with the applicable requirements of the Rules. The proposed design does not comply with the applicable requirements of the Rules as outlined below:

- Env-Sw 1103.01 General Design Requirements provides under Env-Sw 1103.01(a) that “[a] facility shall employ best practicable technology(s) and sound engineering practices in meeting the applicable design requirements in the solid waste rules.” For the reasons outlined above, the subject design fails to comply with this rule.
- Env-Sw 1004.01 Basic Design Requirements provides under Env-Sw 1004.01(a) that “[t]he design of a facility shall be compatible with achieving the universal environmental performance requirements in Env-Sw 1002.” Env-Sw 1002 Universal Environmental Performance Requirements provides under Env-Sw 1002.01 that “[f]acilities shall be located, designed, constructed, operated and closed in a manner that conserves natural resources and is protective of the natural environment, human health and safety.” Because the subject design has a greater risk of liner failure when compared to more conventional designs and therefore has a greater risk of releasing leachate and/or landfill gas to the environment, the proposed design does not meet the cited requirement. DES’s analysis of the issues of constructability, durability and performance, as outlined above, also supports a finding that the design fails to comply with Env-Sw 1004.01 and Env-Sw 1002.
- Env-Sw 1103.01 General Design Requirements provides under Env-Sw 1103.01(b) that “[w]here options exist relative to design concepts, preference shall be given to the option which provides:
 - (1) The least complex alternative(s) for facility construction, operation and maintenance; and
 - (2) Exhibits the required performance standard(s).”

The subject design fails to comply with this rule. The proposed MSE berm/liner design requires deployment of a liner system on 2039 lineal feet of 39 foot high wall at a near-vertical 1:5 slope. This liner system is untried, essentially experimental in nature, and is significantly more complex with respect to its construction, operation, and maintenance when compared to deployment of a liner system on a conventional 3:1 slope.

Therefore, in accordance with Env-Sw 305.03(b)(1) and (2), DES denies the applications.

B. Groundwater Contamination

Beginning in 1996, DES required that NCES apply a tracer compound, sodium bromide, to the NCES Landfill, Stage II and Stage III. The NCES Landfill has been constructed, in part, on top of the footprint of the former unlined landfill (waste removal and relocation into Stage I of the lined landfill began in December 1991 and was completed in October 1993). The bromide tracer was required to be added to the landfill operations for the Stage II and Stage III lined portion of the landfill to aid in differentiation of groundwater quality impacts associated with the previous releases from the former unlined landfill from a failure of the existing double HDPE geomembrane leachate liner collection system. Because sodium bromide was not added to the unlined landfill, detection of bromide concentrations above background values in any monitoring wells downgradient of the landfill would indicate that there were liner leak issues.

Volatile organic compounds or elevated concentrations of bromide have been detected in groundwater monitoring wells located downgradient from the landfill, including wells MW-402U, MW-403L, B-913M, B-919U, B-921M, B-921U and B-304UR. The detection of the VOC contaminants and elevated concentrations of bromide indicate that the operation of the existing landfill has resulted in releases of regulated contaminants in violation of condition #9 of Groundwater Management and Release Detection Permit #GWP-198704033-B-005 (Groundwater Permit), which was issued to the applicant in November 2007.

The key issues of concern relative to these detections of VOCs and elevated concentrations of bromide were outlined in Section D of DES's September 10, 2008 technical review letter. In that letter, DES requested that additional information be provided to further evaluate the source of the VOCs and the elevated concentrations of bromide detected in downgradient monitoring wells. In response to this request for additional information, the applicant provided the documents listed as application information items 8. and 9. above.

These documents provide a detailed hydrogeological and engineering analysis of the situation to support NCES's contention that the landfill liner system is not leaking and is not the source of the elevated concentrations of bromide and VOCs detected in several monitoring wells. In these documents, NCES concludes that the releases are not due to a leaking liner system and are most likely due to known leachate spills and an accidental discharge of leachate to stormwater systems during 2006 construction events.

Because NCES's hydrogeological and engineering analysis relies on a number of assumptions regarding aquifer properties, construction history, and the current condition of the existing landfill liner system that are not verified by independent field or environmental data, the analysis is not conclusive. DES does not agree that the analysis demonstrates that the liner system is not leaking. Until NCES completes the on-going corrective action plan and produces data to demonstrate that the work has resulted in achieving DES-approved performance standards for groundwater remediation, DES concludes that the landfill liner system is or may be a contributing factor to the contamination in the monitoring wells.

There is uncertainty as to whether the VOCs and elevated concentrations of bromide detected in the downgradient wells are the result of NCES's own mismanagement of the leachate collection system. By virtue of the past spills and releases from the leachate collection system (the occurrence of which NCES has acknowledged), NCES has raised doubt as to the source of the VOCs and elevated concentrations of bromide. The bromide tracer's function is to detect the presence of leaks in the liner system. To the extent NCES is now unable to satisfy DES that the landfill liner is not the source of the groundwater contamination, it is due in large measure to NCES's own operational failure at the facility.

Env-Sw 1002.02(d) provides in pertinent part that "[f]acilities and practices shall not contaminate surface or groundwater in violation of...the conditions of any permit issued by DES..." Based upon the groundwater quality conditions, the analysis and data presented, and the status of the corrective action plan implementation, DES concludes that there have been releases that have in fact contaminated groundwater in violation of the conditions of the facility's Groundwater Management and Release Detection Permit. Because the contamination detected at the site is consistent with what would be expected with a release from the liner system and because NCES has not demonstrated to the satisfaction of DES that there is no ongoing release from the facility, DES can not conclude at this time that the proposed facility can comply with Env-Sw 1002.02(d). Therefore, in accordance with Env-Sw 305.03(b)(2), DES can not approve the application.

Until the remedial actions are fully implemented and soil and groundwater performance data are collected, DES will not have sufficient information to determine the source of the contaminated groundwater and to conclude that it has been remediated.

In summary, and for the reasons outlined in this letter, DES hereby denies the requested applications for permit modification.

III. Continuing Groundwater Management Obligations

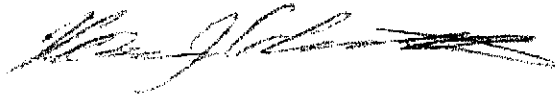
Irrespective of this permit decision, DES notes that the applicant remains responsible to continue and complete the ongoing remedial work as required by Groundwater Management and Release Detection Permit #GWP-198704033-B-005. Correspondence regarding the proposed groundwater performance standards, as contained in NCES's October 13, 2008 response to the September 10, 2008 DES Comment Letter, will be issued by DES under separate cover.

IV. Appeal

In accordance with RSA 149-M:8 and Env-Sw 305.03(a)(3), this decision issued by DES may be appealed to the Waste Management Council as provided under RSA 21-O:9, V and Env-WMC 200.

If you have any questions regarding this decision, please contact me at the letterhead address, via telephone at (603) 271-1997, or via e-mail at michael.wimsatt@des.nh.gov.

Sincerely yours,



Michael J. Wimsatt, P.G., Director
Waste Management Division

Department of
Environmental
Services

Digitally signed by Department of
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Appendix A: Response to Public Comments

CC: Bryan Gould, Esq., Brown, Olson & Gould
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Brenda Keith, Esq., Boutin & Altieri
Robert Grillo, P.E., CMA Engineers
Paul Rydel, P.G., SHA Associates
Thomas Burack, Commissioner, DES
Richard Head, Esq., NHDOJ
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Robert Scott, DES



APPENDIX A

RESPONSE TO PUBLIC COMMENT

December 12, 2008

North Country Environmental Services (NCES)

Applications to Modify Permit # DES-SW-SP-03-002

Stage IV Phase II of the NCES Landfill

Trudeau Road, Bethlehem, New Hampshire

On July 15, 2008 the Department of Environmental Services (DES) held a public information meeting regarding the above-noted applications. On September 16, 2008, DES held a public hearing in Bethlehem to receive public testimony on the applications. The public hearing record was held open through October 16, 2008 for receipt of written testimony. During both the information meeting and the public hearing period, DES received many comments and questions from the public. The following is DES's official response to said comments and questions. Please note that some of the comments and questions have been grouped together to maximize the efficiency of the response.

I. CONCERNS AND QUESTIONS ABOUT THE PERMITTING PROCESS

(1) Several commenters asked why the application is being processed as an application for a Type I-B permit modification instead of an application for a new permit, with its required public benefit determination.

In 2003, NCES was granted a standard permit for Stage IV comprised of two million cubic yards of capacity over 11.5 acres. The permitted life expectancy of Stage IV is 10.5 years. As part of that permit review process, a public benefit determination was made pursuant to RSA 149-M:11.

An application for a new permit would be required only if the applicant were seeking to expand the boundaries of the landfill footprint as specified in its permit. See NH Solid Waste Rule Env-Sw 103.47, which defines a landfill expansion beyond the footprint boundaries to be a new facility. However, in this particular case, the applicant is not seeking to expand the footprint boundaries but instead is seeking to place additional materials within the footprint of the existing landfill (Phases I, II and III). Therefore, DES determined that the proposed change was classified as a Type I modification in accordance with the definitions provided in Env-Wm 315.02. The classification of the proposed change was further determined to be a Type I-B modification as specified in Env-Sw 315.02(c), based on the fact that NCES was neither seeking to increase the capacity of the facility as specified in its permit, nor to reduce the life expectancy of the facility as specified in its permit, nor to make any of the other changes that are listed in Env-Sw 315.02(b) to be "Type I-A modifications."

Further, since the application does not seek additional capacity or a change in life expectancy, and proposes to utilize the existing permitted footprint of the landfill, a new public benefit determination is not required by RSA 149-M:11.

(2) How does DES's Environmental Equity Policy apply to this application? Isn't the NCES landfill an environmental inequity to the Town and therefore approval of the application a violation of the policy?

DES's Environmental Equity Policy directs DES to recognize and consider the fact that areas with minority and low income populations have faced an inequitable share of risks from environmental hazards. The Environmental Equity Policy provides a guiding principle for DES decisions, similar to the guiding principle for protection of human health and the environment. In applying this guiding principle during review of the subject applications, DES compared Bethlehem's economic and minority demographics to other NH communities using data published on the State's website. According to these data, Bethlehem's population does not differ significantly from other communities in NH in terms of median income and percentage of population below poverty line. Therefore, there is no basis for determining that the landfill places an inequitable risk on such populations.

(3) Has NCES provided financial assurance to cover unforeseen catastrophic events? If not, shouldn't such coverage be required?

Consistent with federal requirements in 40 CFR 258, as well as requirements by some other states, the NH Solid Waste Rules currently require solid waste facility owners to assure the availability of adequate funds to cover the cost of facility closure and scheduled post-closure care under normal conditions, but there is no explicit provision requiring facility owners to predict the cost of and assure funds for unforeseen catastrophic events. DES agrees that the state should consider options for reducing its risk of financial exposure in the event of catastrophic events. These other options will require legislative changes and/or rule changes.

(4) Is the financial assurance mechanism sound?

NCES currently provides financial assurance through an insurance policy issued by Evergreen National Indemnity Company (ENIC). Based on a review conducted in consultation with the NH Insurance Department and the state of Ohio (where ENIC is domiciled and therefore audited), DES has determined that the insurance policy is sound.

(5) The remedial action plan (RAP) for addressing groundwater contamination at the site, which DES approved on May 28, 2008, proposes to tie new leachate piping into existing leachate force mains that are located outside of the 51 acres in an area that the Supreme Court has determined requires local approval for landfill development. Drainage structures including catch basins, drain pipes, and silt fences as well as overhead electric utility lines and portions of the anchor trench are also located outside the 51 acres. Why has DES not questioned the legality of the placement of these existing features?

DES has no authority to rule on local land use regulations. As provided in RSA 149-M:9,VII, it is the responsibility of the permittee to obtain local approvals required under all applicable, lawful local ordinances, codes and regulations not inconsistent with RSA 149-M.

(6) The Stage IV landfill as originally permitted includes capacity located outside the town approved 51 acres. In light of the Supreme Court's decision, isn't that capacity illegal and therefore not available for developing Phase II?

In 2004, the NH Supreme Court ruled on the extent to which local approvals are necessary for landfill expansion at this site. It did not rule on any aspects of the state-issued permit for Stage IV. Therefore, for the reasons provided in response to (1) above, NCES is not prohibited from seeking to modify the permit by moving the previously approved Stage IV capacity to within the 51 acres, provided such modification conforms with all applicable local, state, and federal design standards and other requirements.

II. CONCERNS AND QUESTIONS ABOUT WATER QUALITY

(1) The public expressed concerns relative to the potential threat the existing and proposed landfill poses to the aquifer underlying the NCES property. Many believe that this aquifer is of particular high quality and that a landfill cannot or should not be allowed.

Stratified-Drift Aquifer at NCES's Property

The following describes the stratified-drift aquifer that underlies the NCES facility.

The NCES facility is located on a stratified-drift aquifer. In NH, stratified-drift aquifers are potentially valuable sources of groundwater depending on water quality, their size (lateral extent and saturated vertical thickness which determines storage), transmissivity (capability to transmit groundwater which is relatively high in coarser sands and gravel) and hydraulic connection to dependable sources of adjacent good quality surface water.

In the statewide groundwater reconnaissance conducted by the U. S. Geological Survey in the 1970s, the property was within an area designated as an area "inferred to be underlain by medium to very coarse sand or sand and gravel with sufficient saturated thickness to have high potential to yield water".¹ This conclusion was based on the presence of sand and gravel at the land surface and a 1954 test well southwest of the intersection of Route 302 and Trudeau Road,

Subsequent, more detailed investigations by the USGS, including subsurface drilling logs, demonstrate that there is not enough coarse granular material with sufficient saturated thickness to have a high potential to yield water.²

¹ Cotton, J. E., 1976a, Availability of ground water in the middle Connecticut River basin, west-central New Hampshire: U.S. Geological Survey Water Resources Investigations Report WRI 76-18, scale 1:125,000, 1 sheet)

² Flanagan, S.M., 1996, Geohydrology and water quality of stratified-drift aquifers in the Middle Connecticut River Basin, west-central New Hampshire: U.S. Geological Survey Water-Resources Investigations Report 94-4181, 224 p., 8 pls.

This more recent report shows that the stratified-drift aquifer in this area is a little less than 4 square miles in area. About 60 percent of the area is in the adjacent Gale River watershed and is not characterized relative to its potential productivity. That part of the aquifer in the Ammonoosuc River watershed is characterized as having a transmissivity generally less than 1000 ft²/day and a saturated thickness of productive material generally less than 20 feet. One small area in the western part of NCES property has a saturated thickness of 40 feet and a transmissivity greater than 1000 ft²/day. In addition, a small area west of the intersection of Route 302 and Trudeau Road has a saturated thickness of 80 feet and a transmissivity reaching 2000 ft²/day. (Major stratified-drift aquifers in the state have transmissivities greater than 2000 ft²/day and saturated thicknesses greater than 40 feet.)

Potential production from the aquifer beneath the NCES facility is extremely small. The area contributing groundwater to the site is very small because it is near the upper reaches of the groundwater basin flowing northward to the Ammonoosuc River. Most of the groundwater in the aquifer south of the site flows southerly within the Gale River watershed. The saturated thickness (storage) of the productive zones within the aquifer is generally very limited. Aquifer material is predominately fine grained (silt and sand with lesser amounts of clay and gravel). Thus, the capability to transmit groundwater is small. Hydraulic conductivity tests just northwest of Stage I suggest a transmissivity value of about 1100 ft²/day. In contrast and as stated above, major aquifers have transmissivity values above 2000 ft²/day. It is noted that the U.S. Geological Survey assigned a saturated thickness of less than 20 feet (limited storage) and a transmissivity of less than 1000 ft²/day to the rest of the aquifer.

Groundwater flow from the NCES site contributes water in a northerly direction toward the Ammonoosuc River. Springs, including the so-called main seep, along the steep valley wall above the river have generally been interpreted to be at the contact between the bottom of the stratified-drift aquifer and underlying till. Thus, at that point (i.e., at the seeps), the stratified-drift aquifer is not connected directly to the river. Downstream where the southern riverbank topography changes from the steep valley wall to flatter terrain, the stratified-drift aquifer is in contact with the river. Based on a test well drilled in 1954, it was estimated that the potentially most productive area within the stratified-drift aquifer in this part of the Ammonoosuc Valley is near the intersection of Route 302 and Trudeau Road. This area is over 0.8 mile from the NCES facility.

Legality of Siting a Landfill over the Aquifer

RSA 485-C establishes 4 classifications for groundwater: GAA, GA1, GA2 and GB. Env-Dw 900 sets out rules whereby a "local entity" may request the reclassification of groundwater within an aerial extent depending on its use and relative value. The classifications above are listed in descending order of protection with GAA the most protective followed by GA1 and GA2. All other groundwater is classified GB by default.

RSA 485-C:12 prohibits the siting of a new landfill over an aquifer that is classified GAA. There are no such siting prohibitions over aquifers with any other classification. For groundwater to be

classified GAA it must be within a wellhead protection area for wells currently being used or well sites that have been identified for future use.

The aquifer under the NCES landfill is classified as GB and GA2 and there are no prohibitions against siting a landfill in this location. Moreover, in the event that the aquifer could be reclassified to GAA it would not necessarily preclude expansion of the landfill since the expansion may not meet the definition of a new facility in Env-Dw 901.03(k).

(2) How does the “rural river” designation of the Ammonoosuc River affect the application?

The segment of the Ammonoosuc River that lies near the landfill is classified as a “designated rural river segment” under the NH Rivers Management and Protection Act, RSA 483. Specifically, RSA 483:9-a, VII prohibits the siting of new landfills within the corridor of a designated rural river segment or within 100 feet from the landward extent of the 500-year floodplain whichever distance is greater. Although a portion of Stage II lies within the corridor, the subject proposal is not for a new landfill. The statute also prohibits the expansion of existing landfills within 100 feet from the landward extent of the 500-year floodplain. Although the subject proposal is an expansion of an existing landfill, the facility does not lie within 100 feet of the landward extent of the 500-year flood plain.

(3) Volatile organic compounds (VOCs) and bromide, a chemical tracer, have been detected in groundwater monitoring wells at the site. Does this mean that the landfill is leaking?

DES’s decision letter of December 12, 2008 addresses this question.

(4) There is a concern about potential contamination in bedrock that may be traveling undetected.

Numerous phases of subsurface explorations have been completed at the site, which have provided a great deal of hydrogeologic data. These data indicate that there is a substantial overburden thickness below the site. There are a series of very dense and thick glacial sediments that are comprised of a lower till unit overlain by stratified drift, which in most areas is overlain by an upper glacial till. The subsurface explorations completed to date also indicate that the bedrock surface is present in the westerly portion of the site at a depth of approximately 113 feet and slopes northeastward to a depth over 250 feet. In general, the stratified drift deposit represents the most permeable subsurface material observed at the site. However, in a few portions of the site, the lower till unit represents the most permeable material. Groundwater flow in general has a tendency to travel laterally via the most permeable layer. This flow tendency was demonstrated previously at the site when contamination from the former unlined landfill was shown to flow laterally through the more permeable stratified drift unit with an ultimate discharge to the so-called “main seep” on the bank of the Ammonusuc River.

Several series of multi-level wells are installed throughout the site. The wells are screened in each of the upper till, stratified drift and lower till units. This extensive system of multi-level

wells allow for monitoring the different overburden units and are regularly sampled to detect potential releases of contaminants from the landfill. Available groundwater monitoring data do not indicate that contaminants are discharging to the lower till unit or into bedrock. While contaminants and the bromide tracer have been detected in overburden wells, the concentrations of the contaminants (with the exception of arsenic) have not exceeded their respective ambient groundwater quality standard (AGQS) and the substantial evidence is that contaminants have not migrated into bedrock. The concentration of arsenic in several monitoring wells has exceeded the AGQS for arsenic of 10 micrograms per liter. However, the area in which arsenic exceedances have occurred is limited to the vicinity of the landfill and is attributable to the former unlined landfill. Arsenic has not been detected migrating off site at concentrations exceeding the AGQS.

Nonetheless, the presence of contaminants in groundwater is a concern and must be addressed by NCES.

(5) There is concern that DES is not requiring testing for all relevant parameters in groundwater and therefore does not fully understand conditions at the site and the potential impact the landfill may be having on groundwater. Professor McDowell from the University of NH suggests the need to do a broad scan of the inorganics and total dissolved organic matter in selected wells. This would include sodium, potassium, calcium, magnesium, sulfate, and dissolved organic carbon and nitrogen. He indicates that he would like to see these analyses be used as a forensic tool to help understand the nature of contamination with trace organics.

To date, DES's assessment of site conditions has been based on an evaluation of the standard groundwater testing parameters specified in the facility's Groundwater Management & Release Detection Permit. DES determined that the collection of the additional parameters suggested by Professor McDowell would not aid in our current decision for this specific project. Nonetheless, DES intends to further consider Professor McDowell's suggestions to determine whether state requirements (ref. Env-Or 700) for monitoring groundwater quality at lined landfill sites should be amended to include additional parameters for detection and assessment monitoring of the water quality.

(6) Are any private wells at risk? Specifically, there was a request to test wells on Muchmore Road and Laurel Lane.

Over time, DES has extensively reviewed site hydrogeologic data and water quality information in efforts to verify that the extent of the contaminant plume attributable to the former unlined landfill is well defined and delineated. The plume is contained within a well defined and delineated Groundwater Management Zone (GMZ) established for the site. The GMZ is determined based on the subsurface volume in which groundwater contamination associated with a discharge is contained. DES is not aware of any actively used drinking water supply wells within the established GMZ for this facility. Additionally, DES has no information to suggest that there are any drinking water supply wells located outside of the established GMZ that are at risk of being impacted by activities at the landfill site.

In regard to Muchmore Road and Laurel Lane, DES notes that residences on these roads are all served by municipal water.

(7) Is the landfill affecting the Ammonoosuc River?

In response to previously expressed concerns about water quality in the Ammonoosuc River, DES undertook a comprehensive sampling effort in 2007. Based on the results of those efforts, DES did not identify any adverse impacts in the Ammonoosuc River.

(8) No permit should be issued until the remedial action plan has been completed and shown to work.

DES's decision letter of December 12, 2008 addresses this comment.

(9) Even if the groundwater contamination at the site was caused by past leachate handling practices and not an ongoing leak, shouldn't NCES be accountable for the releases and not granted permission to expand the landfill?

DES's decision letter of December 12, 2008 addresses this question.

(10) Is the landfill in the 500-year floodplain?

The landfill is not in the 500-year floodplain. The boundary of the 500-year floodplain is located on the steep riverbank well away from the landfill.

III. QUESTIONS AND CONCERNS ABOUT DESIGN CRITERIA

(1) Should design criterion for drainage structures be more conservative than a 25-year storm? (Note: This question was raised because it seems that in recent years NH has experienced more intense storms and flooding than in the past. The commenters suggested that a more conservative design standard, such as a 100-year storm, should be required for design of landfill stormwater drainage systems).

By definition, a 25-year storm is a storm of such intensity and duration that its probability of occurrence at any time is 4%. Similarly, a 100 year storm is a storm of such intensity and duration that its probability of occurrence at any time is 1%.

The NH Solid Waste Rules specify that landfill stormwater drainage structures and appurtenances must be designed to accommodate the runoff expected from a 25-year storm. The NH Solid Waste Rules further require the landfill leachate collection and containment systems to be designed to handle a 100-year storm. Landfill stormwater drainage systems and leachate collection systems must be hydraulically separate by design.

The rainfall estimates used to calculate the size of drainage structures are obtained from Technical Paper 40 (TP40) published by the National Weather Service in the year 1961. Because landfill stormwater drainage systems designed on the basis of the TP40 rainfall figures have so far performed satisfactorily throughout the state, DES is satisfied the current standard is protective. Nevertheless, DES is attentive to concerns about the potential effect of climate change on the data used in environmental modeling and analyses.

(2) There is a concern that the design engineer who did the structural design of the berms is employed by Tensar, the company that manufactures the geosynthetics used in design, and therefore may have a conflict of interest.

DES does not share this concern. Standards of professional practice for engineers, including ethics, are regulated through licensing at the state level. Engineers who perform engineering work in NH must be licensed as professional engineers in the state through the Joint Board of Licensure and Certification. Tensar is a nationally recognized manufacturer of geosynthetic products and routinely performs design work for structures that employ its products, including design work at other landfills in NH. Tensar's design engineers are licensed in NH. The DES is not aware of any problems with the quality of design work performed by Tensar's engineers. In addition, the DES performs an engineering review of submitted designs.

(3) Does DES do an independent design of the landfill components, in particular the berms?

No, DES does not do an independent design. However, DES conducts a thorough engineering review of all aspects of applications it receives. The review is done to ensure conformance with sound engineering practices and the NH Solid Waste Rules. The design engineer, who must certify the plans and specifications, is the engineer of record and is, therefore, responsible for design.

(4) All liners leak; why are they used?

The standard geomembrane landfill liner design required by the NH Solid Waste Rules is a double 60 mil geosynthetic membrane liner system. The primary liner serves as part of a leachate collection system and the secondary liner serves as part of a leak detection system for the primary liner. This arrangement conforms to federal standards (ref. 40 CFR 258) for landfill design and is consistent with requirements around the country.

Several commenters noted that various engineers have stated that all liners leak. It is probably more accurate to state that all liners will have imperfections that can result in leaks. These imperfections can include pinholes, imperfectly welded seams, and construction related damage (tears or holes). Whether or not these imperfections will result in a leak depends on their location, the severity of the defect or damage, and the overall design and management of the leachate collection and removal system for the landfill. Primary liner systems are designed to quickly move large quantities of leachate off of the liner and into leachate collection and removal systems. In so doing, the system prevents the buildup of leachate on the primary liner, which

helps to ensure that there is no driving force to move leachate through a liner defect. The secondary liner is similarly designed to efficiently drain any leachate that does make it through the primary liner, and move it to collection and removal systems. Further, even if leakage from the secondary liner does occur, it may not be of sufficient magnitude to adversely impact groundwater quality. Since the primary function of the liner system is to contain landfill contaminants and protect groundwater quality, this is the most important factor.

Concern has also been expressed about the long-term performance of the liner system because all constructed systems degrade and liner technology is only about 20 years old. It is true that the long-term performance of liners will not be definitively known until they have been around for many more years. However, DES does have significant knowledge and experience with unlined landfills and how they perform. Some of NH's unlined landfills are as big as or bigger than the NCES landfill. Experience has shown that once these landfills are capped, the VOC contamination diminishes and attenuates over time, despite the lack of liner.

The landfill design standards required by both the NH Solid Waste Rules and the federal landfill regulations in 40 CFR 258 are protective of groundwater, and provide mechanisms for identifying and addressing problems.

(5) How is the risk of damage from an earthquake handled?

Per 40 CFR 258.14 and Env-Sw 803.04(a)(1), landfills can not be sited in a seismic impact zone unless a seismic analysis by a licensed engineer shows that all containment structures can withstand the maximum horizontal acceleration in lithified earth material for the site. By definition, a seismic impact zone is an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's magnetic field (g), will exceed 0.10g in 250 years. Bethlehem is in a seismic impact zone with an acceleration of approximately 0.15g. As required, the submitted facility plans were designed to meet this requirement.

(6) A concern was expressed that a lightning strike on the landfill could put a hole in the cap and/or liner.

DES made inquiry of the Association of State and Territorial Solid Waste Management Officials, the Solid Waste Association of North America, and other solid waste professionals to see if there is any known record of a lightning strike causing damage to a geosynthetic liner or cap. DES was unable to find any reports or records of actual damage to landfill caps or liners from lightning strikes. However, DES found an article on the RACHEL ERF website, which may have prompted the question. The article presents a hypothetical analysis of damage to a cap resulting in a hole 8-inches in diameter and up to 15 feet deep. The article cites no actual occurrences.

There have been several reports of lightning strikes affecting landfill operations buildings, computers, scale devices and leachate pumps etc. There was also one report in Virginia of a fire

in the working face that was associated with a lightning strike. None of these reports appeared to involve the caps or liners.

DES notes that if damage were to occur on a geosynthetic cap, it could be repaired.

(7) Placing more waste on top of the landfill will force more leachate through the liner.

Hydrostatic pressure or the driving force (as described in (4) above) of leachate over the liner is a function of how high the free surface of the liquid is over the liner. This liquid is the leachate that fills the voids between waste and soil particles and is independent of how high the waste pile happens to be. Placing waste higher over the existing waste would have no effect on hydrostatic pressure on the liner.

(8) DES should require an independent geotechnical engineering review.

In its December 12, 2008 decision letter, DES denied the subject applications based upon its own engineering review of the application. No further geotechnical review is necessary for this application.

IV. QUESTIONS AND CONCERNS ABOUT WASTE ISSUES AND POLICIES

(1) There is a concern that the NCES landfill is being filled with out-of-state waste.

A review of annual reports submitted by NCES over the past ten years shows that a majority of waste disposed at this facility was generated in NH and did not come from out-of-state. In the past ten years, 17.3% of the total waste disposed at the facility, on average, has been imported from outside of NH. Due to provisions in the United States Constitution, DES cannot prevent the importation of all waste coming from outside of the state.

(2) DES should suspend the permitting process until the Legislature can act on legislation concerning landfills.

The subject applications were processed and reviewed in accordance with laws and rules that are currently in effect. In particular, NH RSA Chapter 149-M (Solid Waste Management Act), RSA Chapter 541-a (NH Administrative Procedures Act), and the NH Code of Administrative Rules for Solid Waste Management govern the DES's review and processing of this application. DES does not have authority to process or suspend review of this application on any other basis.

(3) DES should collect and analyze all required environmental monitoring data, rather than NCES or its consultants.

The current law and rules governing regulation and permitting of this facility provide a framework that relies upon data collection and reporting by the permittee. DES's laws, rules and policies help to ensure the quality and reliability of the data that are presented to it. These

safeguards include requiring that all engineering and hydrogeological work be performed by licensed professionals, and all chemical analyses be performed by certified laboratories. Further, DES employs licensed professional engineers and geologists to perform technical review of the submitted reports and data.

V. QUESTIONS AND CONCERNS ABOUT AIR EMISSIONS, HEALTH AND SAFETY

(1) What regulatory requirements regarding air quality is the NCES landfill required to meet and where are they in the process?

An air permit for the flare system was originally issued in November 2000 and the flare system is still operating under that permit. In 2003, NCES applied for and obtained a permit from the DES to expand the landfill. Upon issuance of that permit, the permitted capacity of the landfill became large enough such that the facility was required to apply for a different type of air permit, i.e., a Title V Permit to Operate. NCES submitted an application for a Title V Permit to Operate on June 14, 2004. Since that time, DES has been working with NCES to perform sampling at the facility to collect additional data for the application and develop standardized landfill operating and monitoring protocols to enhance landfill gas management. On January 7, 2008, NCES submitted an update to the Title V Permit to Operate application which incorporates the additional sampling and gas management information developed by DES and NCES. The application encompasses all air emission activities at the landfill (e.g., the flare system, landfill gas collection system, and fugitive emissions). DES is reviewing the application and anticipates publishing a draft decision in early 2009.

(2) What are the actual air emissions at the landfill?

All sources with air permits are required to report actual emissions of regulated pollutants on an annual basis. The most recent emissions report for the flare system is for calendar year 2007. Actual emissions from the flare system during 2007 were:

Particulate:	5.74 tons
Sulfur dioxide:	1.97 tons
Nitrogen oxides:	9.43 tons
Carbon monoxide:	13.11 tons
Volatile organic compounds:	0.98 tons

Additional information regarding air pollutant emissions is available in NCES's application for a Title V Permit to Operate, which is available on DES's OneStop online database.

(3) There is a concern that asbestos will be encountered during excavation operations in existing waste.

In order to tie the proposed new leachate collection system to the existing system, NCES had proposed in the denied applications to excavate waste in Stage I to expose the leachate collection

sumps to build a new sump and connect the new leachate collection system to it. The area where the excavation was proposed to take place, Stage I, was permitted to accept asbestos. The NH Solid Waste Rules require that the asbestos disposal locations be documented, which was done for Stage I.

Commenters expressed concern that construction and demolition debris from the Mountain View Hotel renovation project, which the DES alleged to have contained asbestos, would be excavated during the above-described project. This is not the case. The C&D waste from the hotel was received between October 1999 and May 2002, while NCES was operating Stages II and III. As noted above, the proposed excavation was proposed exclusively in Stage I. Therefore, C&D waste from the Mountain View Hotel would not have been encountered in this project.

Nevertheless, DES notes, that in any waste excavation project, unexpected wastes, including asbestos, may be encountered. Therefore, for these types of projects, the contractors are required to implement a DES-approved Site Safety and Contingency Work Plan to control and monitor the work, including procedures for safely handling asbestos waste and assuring no releases occur.

(4) Many commenters expressed concern that living in proximity to a solid waste landfill increases their risk of disease and that studies confirm this.

In response to this concern, the DES Environmental Health Program was asked to evaluate whether living near a solid waste landfill increases a person's risk of disease. There are a number of published health studies in the epidemiological literature that examine the nature and incidence of human disease in communities where landfills and other types of waste disposal facilities are located. These studies have sometimes reported an association between the presence of a landfill and certain health outcomes (mortality, cancers, self-reported health problems) among residents in these communities. Typically these studies have not considered actual exposure to the chemical contaminants in the landfills, but instead have used place of residence in the community as a surrogate for human exposure. It should be noted that a number of studies that have attempted to evaluate human exposure to chemical contaminants through biomonitoring (i.e., measuring chemicals or chemical by-products of exposure in blood, urine and other tissues) have generally not found elevated levels of these substances in their human subjects.

From the review of the epidemiological literature, the Environmental Health Program concluded that health studies of landfills have not shown a relationship between landfills and a public health hazard. It is not appropriate to generalize on the nature of landfill hazards. All landfills, and the communities in which they are situated, are unique for a number of reasons. There are differences in landfill construction (e.g., lined vs. unlined landfills), the types of wastes that are buried in a landfill (e.g., municipal solid waste vs. construction and demolition debris vs. hazardous waste), and hydrology of the area surrounding the landfill. Every landfill facility and its potential impact on a host community needs to be evaluated on an individual basis. These evaluations need to incorporate actual exposure to landfill contaminants in order to determine whether a landfill presents a public health hazard to the community where it exists.

(5) Have there been any health related impacts directly related to this landfill?

The DES Environmental Health Program memo report titled "Evaluation of Environmental Health Data" dated October 3, 2008 addresses this question.

(6) What is the emergency / evacuation plan in case of a hazardous material (hazmat) incident at the landfill?

In the event of a hazardous materials or hazardous waste spill/release at the NCES landfill, the operators of the landfill are required to notify local, state, and in some cases, federal response agencies, including:

1. Bethlehem Fire Department
2. National Response Center
3. DES (or State Police dispatch after hours)

In NH, fire departments are the first responders to hazardous material/waste incidents and the highest ranking fire official on scene is the incident commander. After responding to the scene and evaluating the event, the fire chief might call and mobilize the North Country Emergency Response Team (NCERT). Decisions on response actions or whether or not evacuation is necessary would be made by the incident commander after consultation with his support groups. DES would provide oversight for development of long term remediation plans.

DES has considerable experience dealing with hazmat incidents. These incidents include hazardous waste transporter accidents, spills and fires. There are set procedures in place at the state level to address them. Since the NCES landfill is permitted to receive only solid waste, regulated hazardous wastes should not be sent to or received at the landfill. However, it is always possible that hazardous waste might be inappropriately transported to the facility. The most plausible hazmat incident that could occur would be an accidental spill of regulated hazardous waste that was inappropriately sent to the facility.

(7) There were several comments regarding the former leachate evaporator, its monitoring or lack thereof.

Use of the leachate evaporator was discontinued during the spring of 2007. DES has not received any request or application from NCES to resume its operation and its use is not part of the subject applications.

(8) No permit should be issued because there is uncertainty about the health effects of landfills. We may learn something in the future that we don't know now.

Per the December 12, 2008 decision letter, the subject applications have been denied. As previously stated, DES has concluded that the landfill is not linked to any health concerns in the community.

